CANAL IRRIGATION IN BRITISH INDIA

Perspectives on technological change in a peasant economy

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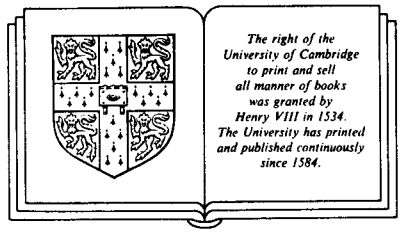

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Introduction

Described recently by one economic historian as among the 'greatest monuments to British rule',[1] the harnessing of the waters of India's great rivers for irrigation purposes would appear one of the most positive ways in which the colonial regime contributed to Indian welfare. Despite the scale of this effort – one acre in six was irrigated from government schemes by the late 1930s – there is an almost total absence of modern historical studies into their impact. We are, in fact, very much in the dark as to the nature and distribution of the effects they had upon the peasant economy in general. The only study of this topic constitutes a single section of a book, published in 1972, on the Uttar Pradesh agrarian economy in the closing decades of the last century.[2] The western part of the UP,[3]

[1] W. J. Macpherson, 'Economic Development in India under the British Crown, 1858–1947', in A. J. Youngson (ed.), *Economic Development in the Long Run* (London, 1972), pp. 144–5. The other main 'monuments' identified were railways, law, and the civil service.

[2] E. Whitcombe, *Agrarian Conditions in Northern India*, vol. I, *The United Provinces Under British Rule, 1860–1900* (Berkeley, Los Angeles, and London, 1972), pp. 64–91. Articles on the topic are rare and invariably undertaken mainly with a view to assisting with current policy formation. This is the case with E. Whitcombe, 'Development Projects and Environmental Disruption: The Case of Uttar Pradesh, India', *Social Science Information*, II:1 (1972), pp. 29–49. Much of the work which does exist focusses upon pricing: B.D. Kanetkar, 'Pricing of Irrigation Service in India (1854–1959)', *Artha Vijnana*, II:2 (1960), pp. 158–68. Additional material is available, by way of historical backdrop, in N. Ansari, *Economics and Irrigation Rates: A Study in Punjab and Uttar Pradesh* (London, 1968); and R.B. Reidinger, 'Institutional Rationing of Canal Water in North India: Conflict between Traditional Patterns and Modern Needs', *Economic Development and Cultural Change*, XXIII:1 (1974), pp. 79–104. Even historian D.R. Gadgil's *Economic Effects of Irrigation: Report of a Survey of the Direct and Indirect Effects of the Godavari and Pravara Canals* (Poona, 1948) is basically a technical cost-benefit analysis primarily oriented towards policy formation and the refining of project appraisal techniques.

[3] In 1901, the North-Western Provinces of the Bengal Presidency were combined with

specifically the Ganges–Jumna *doab*, was the focus for a substantial part of the canal-building activity during the nineteenth century,[4] and the study considers the impact of these schemes upon the ecology and rural economy of this tract. The conclusion its author, Dr E. Whitcombe, comes to is that 'the canals proved a costly experiment',[5] and it is the suggestion that the disadvantages actually outweighed the advantages that constitutes the starting point for this present study.

The basis for Dr Whitcombe's conclusion is the quite bewildering array of adverse effects which she associates with the introduction of the canals. It is argued that, due to the way irrigation was applied in the Doab, the policies over its use and the responses of the peasant cultivators themselves, the canals caused pronounced environmental and economic disruption. The very act of turning large quantities of water over an almost slopeless plains landscape with a comparatively high water-table inevitably led to waterlogging problems in low-lying land, and the problem was made worse by the widespread tendency for water channels to obstruct the existing natural drainage lines. Conditions of saturation were conducive to the spread of *reh* (saline deposits) over the land's surface as capillary attraction brought salt-laden moisture up from the subsoil; they contributed also to the more frequent incidence of malaria, and produced an 'unhealthy humidity'. The rise in the water-table made common earthen wells unstable, and as they fell in the cultivators were forced to rely on the canal's uncertain supply. The peasant afflicted by such calamities was confronted by a typically cumbersome bureaucratic structure which, even if liable to make compensation payments – and the grounds for compensation were elaborately circumscribed by

the Province of Oudh to form the United Provinces of Agra and Oudh (which in turn became 'Uttar Pradesh' after Independence). Except where it is necessary to be specific, the general term 'United Provinces' (abbreviated to 'UP') will be used, whatever the date. 'The Doab', throughout, refers to the Ganges–Jumna *doab*.

[4] While much of the early irrigation development was concentrated in the UP and Madras, the locus of attention later moved north-eastwards to the Punjab and Sind. By the late 1930s the areas (in millions of acres) irrigated by government works were as follows: Punjab 12.3, Madras 7.2, UP 5.3, Sind 4.7, Bihar 0.7, NWFP 0.5, Orissa 0.4, Bombay 0.4. V. Anstey, *The Economic Development of India*, 4th edn (London, 1957), p. 616. For more details, see Ch. 2 below.

[5] Whitcombe, *Agrarian Conditions*, p. 91.

the 1873 Canal Act – was indeed slow to yield up the requisite sums. Moreover, at the lower level of this structure, the cultivator came up against petty officials able to exploit their position of influence over canal supplies and add their various *haqs* to the 'already high' official charges for water from an unnecessarily costly system.[6]

The effect on cultivation itself, the argument continues, and on farm practices was no less damaging. The production of staple foods, particularly the coarse *kharif* staples, was downgraded in favour of commercial crops, a situation particularly urgent in drought years, when – as a consequence and against all expectations – the canal could do little to 'decrease the ravages of scarcity'. As well, the ease of canal irrigation compared with lifting water from wells gave encouragement to overcropping and a concomitant loss of soil fertility; and the disruption of fallowing cycles was aggravated by the attraction of pastoral castes into cultivation, which not only increased the tendency to imbalance and the curtailment of fuel and fodder supplies, but reduced the supply of cattle to agriculturalists. The latter were thus forced to rely on their own, 'often deteriorating', stock for their cattle supply, the inadequacy of which made for slovenly cultivation and constituted a yield-depressant in that farmers faced a reduced manure supply. Lured by the prospect of a less arduous life – and by that of a simultaneously increased value of product – the farmer involved himself in a system of production which 'disrupted [his] former pattern of work', while at the same time his 'techniques were not adapted to deal with such sudden and radical changes'.

Those familiar with the practical effects of large-scale canal schemes and with irrigation bureaucracies will probably find this unfortunate catalogue of effects perfectly plausible. Furthermore, given the character of the tract being studied, there is a distinct likelihood that such disadvantages could have substantially eroded the net benefits arising out of the Doab canals. Canals taken through the virtual deserts of the Punjab and Sind clearly produced large gains in terms of net output. The UP Doab may have been 'before the introduction of canal

[6] 'Unnecessarily costly' because of design faults which either increased construction costs or involved heavy maintenance outlays. See Ch. 2 below.

irrigation . . . among the most insecure in Northern India',[7] but it was also an area already widely cultivated and with extensive facilities for well irrigation. The margin of benefit, therefore, between the value of produce raised before the canal and that made possible by its construction was clearly narrower than the benefit arising from making settled agriculture possible in places previously sparsely populated by pastoralists.

There are problems, however, with this new interpretation. First, and perhaps most strikingly, there is the fact that for most of this period the western districts – and in particular the heavily irrigated northern districts – enjoyed a degree of broadly based material prosperity matched by few areas in India. There are problems also in that some of the responses attributed to peasant cultivators appear to be in conflict with current notions of 'peasant rationality'. Further, although contemporaries were well aware of the unfortunate side-effects of canals, this did not diminish their continued advocacy of canal construction and expansion. Successive Famine Commissions and an Irrigation Commission urged the extension of canal-building programmes, while the Government of India wrestled with the cautious and tight-fisted London Office to obtain the resources to execute such works. This, of course, might be dismissed as simply a reflection of Imperial perceptions as to what form of development was in the rulers' interests, but Indian nationalists, also, have been favourably disposed towards extending canal irrigation, at least to the extent that they have favoured a diversion of government spending in that direction and away from railways (which they consider drained away India's wealth rather than adding to it).[8]

[7] *British Parliamentary Papers* (hereafter *PP*) 1904, LXVI, *Report of the Indian Irrigation Commission, 1901–03*, p. 185. (This report will hereafter be abbreviated to *IIC*.)

[8] Historian Bipan Chandra, for example, is critical of the 'uniformly low' expenditure on irrigation alongside that on railways: see B. Chandra, 'Reinterpretation of Nineteenth Century Indian Economic History', *Indian Economic and Social History Review*, V:1 (1968), pp. 67–8. See also, for 'nationalist' views, R.C. Dutt, *Speeches and Papers on Indian Questions* (Calcutta, 1902), p. 77; and B.M. Bhatia, *Famines in India: A Study in Some Aspects of the Economic History of India (1860–1965)* (London, 1967), p. 198. Irrigation by no means rivalled the railways in terms of resources expended by the state. In fact, the proportion of total government outlays upon 'creative investment' (public buildings, irrigation, agriculture, transport, and communications) taken by railways was up to four times greater than that devoted to irrigation during the 1900s. Bhatia, *Famines in India*, p. 198.

The verdict on the impact of the canals, then, would appear to be very much an open one. Elizabeth Whitcombe assesses its effects upon the peasant community from a position which, very reasonably, regards with suspicion any disruption to what she sees as a viable and well-established social, economic, and technological balance by the incompetent meddling of the British with a peasant system and an ecology neither of which they understood. She accepts the possibility of increased production, but considers that this took place only in a context where a 'depressed peasantry laboured in a distorted environment'.[9] There is certainly – in what is, after all, only a short study – no attempt to weigh the qualitative and quantitative significance of the evidence used to support this position. Nonetheless, the accumulated material highlights the problem areas and creates a strong impression that in the canal divisions all was not well down on the farm. And she is joined in this view by Professor A.K. Bagchi, who, taking a long-term perspective, argues that the canals assisted in the creation of structures within the rural sector which were exploitative and obstructive to efforts to promote growth.[10] Thus, the cash requirements associated with canal irrigation, along with continual rent enhancement in expectation of higher yields, produced, according to Professor Bagchi, a shift in product mix away from millets – the staples of the poor – and, through making extensive cultivation by large landowners profitable, made 'their exploitation of the landless strata of poor peasants more intense'. Although this essentially neo-Marxist approach could – by bringing in the possibility of class alliances and sectional interests – successfully reconcile a situation where further canal schemes were prosecuted in the face of associated disadvantages to specific groups, it does rely heavily upon Dr Whitcombe's UP findings restated within a different framework.

This study[11] of the impact on a peasant economy of an

[9] Whitcombe, *Agrarian Conditions*, p. xi.

[10] A.K. Bagchi, 'Foreign Capital and Economic Development in India: A Schematic View', in K. Gough and H.P. Sharma (eds.), *Imperialism and Revolution in South Asia* (New York, 1973), pp. 49–50.

[11] The pilot study out of which this full-length investigation grew focussed upon eastern Muzaffarnagar, and the preliminary findings were contained in a paper presented at a Conference on Indian Economic and Social History at St John's

exogenous and extensively applied technical change within a colonial setting takes up in detail many of the important questions raised in the Whitcombe study. It is concerned particularly with the way the peasant community adjusted its activities in relation to this new irrigation source. Indeed, if it were necessary to isolate one fundamental issue on which it departs from the Whitcombe view, it would be the character of the peasant's response to the canal. According to Dr Whitcombe, the peasant took to the canal either because he had no choice (his wells fell in), or because he saw the prospect of relatively effortless (but possibly short-term) commercial gain. He thus accepted a technology and a system of farming with significant direct and indirect disadvantages in comparison with the traditional irrigation techniques to which agricultural practices, and society in general, were well adjusted. If it can be demonstrated that the decision to adopt the new mode of irrigation was an altogether more soundly based and rational decision on the peasant's part, then a whole set of alternative interpretations of the canal's impact is possible.

Chapter 3, indeed, does demonstrate that in many (though not all) circumstances, the canal was a more appropriate technology than the traditional methods of irrigation, given the priorities normally exhibited by peasant households and the economic, institutional, and physical conditions in the Doab. Chapter 4 then proceeds to analyse, with the aid of village data obtained from settlement handbooks, how this decision was translated in terms of production and the organisation of agricultural activity. In doing so it also shows how many of the supposed disruptive effects and disadvantages simply do not stand up to close empirical examination; some can only be seen as 'problems' when taken out of context, while the importance of others can easily be exaggerated. Thus, it was not the case – as contemporaries sometimes alleged – that the peasant left the canal to earn his living for him and retired to recount his good fortune from his *charpoy*; in most cases he spent, not less, but a

College, Cambridge in July 1975, subsequently published under the title 'Canal Irrigation and Agrarian Change: The Experience of the Ganges Canal Tract, Muzaffarnagar District (U.P.), 1840–1900', in K.N. Chaudhuri and C.J. Dewey (eds.), *Economy and Society: Essays in Indian Economic and Social History* (Delhi, 1979), pp. 86–112.

good deal more time at work once he received canal water. Moreover, the evidence that some yields were lower on canal-irrigated than well-irrigated land can be shown to be perfectly consistent with an increase in overall output (by value and quantity). Some cultivators rationalised their cattle resources, but the evidence is against the decline in cattle numbers which some officers fancied had taken place, and emphatically against a deterioration in the quality of stock. Similarly, the suggestion of a fall in staple food production is not valid in the context of the crop adjustments across the board induced by the canal, and taking into account the changes in consumption patterns accompanying rising incomes. Much the same can be said of the external diseconomies such as waterlogging and the spread of salinity. It cannot be disputed that some estates were seriously damaged and many holdings incurred production losses on account of these side-effects. But how extensive or persistent were these problems? Did they have a serious effect upon production? The effects, in fact, were variable over time, and there are good reasons for arguing that they may well have been exaggerated. The canal does, however, appear to have had a significant effect upon the incidence of malaria.

A major aim of colonial policy on canals was to decrease the 'ravages of scarcity', and Chapter 7 examines closely the protective role of the canal, re-examining the suggestion that its effectiveness in this regard was restricted by its apparent inability to protect the *kharif* food staples from drought. It can be demonstrated that the canal was far from impotent in meeting the challenge of climatic disruptions. To do this, however, it is necessary to trace its role in terms of the complexities of the peasant production system, involving both stocks and flows (of cash and food crops) and the disruption of exchange values resulting from famine-induced patterns of behaviour. The problem cannot be analysed solely in terms of *kharif* food staples.

To understand more fully, however, many of the patterns produced by the canal – including the types of benefits to which it gave rise and the way these were distributed among areas and within society – it is necessary to know more about the nature of canal irrigation and the way the innovation was applied. As

with any technology, canal irrigation was not 'neutral' in its effects. It was intended to serve the perceived interests of its masters, in much the same way as the earlier irrigation works were. In its design, modes of operation, and intended effects, canal irrigation was ultimately a cultural expression, representing the priorities and aspirations of its western architects, and was inextricably bound up with some of the most vital aspects of colonial rule. It was related directly to the concern exhibited for the spread of commercial crops – and was thus tied up with official efforts at 'agricultural improvement' – as well as having an important bearing upon land revenue (frequently regarded as the point of most contact between rulers and ruled), political security, and famine prevention. It existed, in fact, at the very interface between the colonial presence and peasant society: the water trickling into the field *kiaris* was as tangible as any of the western innovations which filtered down to village level – and more tangible and more pervasive than most. Here, therefore, one might be tempted to think, was a vital agricultural input (under centralised European control) which could be used to bring about change along defined channels. The authorities, after all, determined the nature of the water supply and the terms on which it was made available, and the levers of control and manipulation were potentially influential in affecting crop and irrigation patterns and practices.

As Chapters 5 and 6 in particular show, however, the degree of control exercised by the central irrigation authorities, and their manipulative powers with respect to agricultural improvement, were effectively very limited. Why? The answer has to do with the technical aspects of the canal schemes and the broader administrative framework in which they operated.

More and more, researchers now agree that colonial power was frequently more apparent than real: a gloss that touched society but which did not overturn its fundamental structures. Colonial rule was always a juggling act: there were too few hands, not enough money, and too many considerations to attend to at once to permit policy-makers to realise – or, for that matter, even clearly define – their intentions in any specific area. The multifarious aims of different branches and levels of government, of departments, and of personalities within the

administration spawned compromise (or inertia) as policies were interlocked into the overriding and all-embracing strategy of maintaining stability and British stewardship. As far as irrigation alone was concerned, on a policy level it was simultaneously linked with famine prevention, revenue stability, the settling of unruly tribes, expansion of cultivation, extended cultivation of cash crops, enhanced taxable capacity, improved cultivation practices, and political stability. Thus, as Chapter 5 shows, when it came to pricing canal water, it was difficult even to establish clearly the irrigation priorities that pricing was to reflect. Indeed, it was so difficult to separate the strands of canal policy from those of the broader administrative context that that element of control, of actually directing the way water was used through the price mechanism, was never really tried (though that is not to say that the pricing system was irrelevant to the determination of the way water was used).

For these and the technical reasons discussed in Chapters 5 and 6, the way canal water was deployed was far too dependent upon indigenous structures – within both the bureaucracy and the village – to avoid the blurring of policy intentions at the lower levels, where it was applied. Any institution serves itself to a certain extent, and this was true in irrigation, not only among those at the top, but particularly so at the lower level, where instead of western concepts of efficiency and economy of water use, the prevailing concerns were those of the peasant society to which the subordinate bureaucracy itself belonged, and thus bribery, status, reciprocity, and trading upon petty monopolies asserted themselves.

Technically, the canals proved difficult to regulate with any pretence at precision, though, as Chapter 6 shows, things did improve out of all proportion over the period. Administratively, there was a great reliance upon native staff within the canal bureaucracy, over which supervision was minimal. For these reasons alone – leaving aside the indecision over policy priorities at the state level – manipulative control was not possible. Effectively, canal water at ground level was surrendered to the society itself, and was deployed in accordance with local social, economic, and political priorities. The use patterns, the division of benefits, and the way water was used during drought years were thus largely determined indepen-

dently of government interference. Only when disputes over water and its benefits occurred between parties whose respective resources showed a semblance of balance was even arbitration called for.

Just as the peasant socio-cultural system has mechanisms for adjusting to internal forces disturbing its balance (such as a gradual rise of numbers) and exogenous forces (such as a climatic change or a new overlord), and is flexible enough to incorporate change and new forms of intrusions without losing its long-term stability and viability, so, because of the way it was grafted onto society, canal irrigation was substantially 'absorbed' by that society rather than bringing about fundamental changes in its underlying structure. In common with other elements in the 'modernisation package', it does not deviate significantly from Professor Eric Stokes' assessment that 'the institutional and economic "inputs" of modernity were too feeble to blow apart the structure of Indian society . . . the elastic, accommodating nature of the latter was adequate to contain them'.[12] Indeed, Basil Poff has gone as far as arguing that, even where an entire framework was set up which suited – and was even designed to encourage – innovation and change, the Punjab canal colonists, despite undergoing significant upheaval, 'adapted the colony to themselves and not themselves to the colony'.[13]

If the intentions of British policy-makers – like those of their Indian counterparts in the post-colonial period – were, due to their limited control over an imperfect canal system, destined like other innovations to be moulded according to the specific needs, structures, and technical considerations which are the ubiquitous concerns of peasant society, this is not to dismiss the possibility of change and material progress. Peasant society exhibits continuity of form rather than changelessness, and while it might not constitute change on the scale of the British agrarian revolution – which, for at least some of the time, provided a crude policy model – given the right combination of

[12] E.T. Stokes, 'The First Century of British Colonial Rule in India: Social Revolution or Social Stagnation?', *Past and Present*, LVIII (1973), p. 151.

[13] B.J. Poff, 'Land Management and Modernisation in a Punjab Canal Colony: Lyallpur, 1890–1939', paper presented at the Institute of Commonwealth Studies, London, Feb. 1974, p. 6.

circumstances peasant society can display marked dynamism; it can expand production and improve productivity by the adoption of new crops and investment in technical and organisational innovations.[14] The absence of such trends is frequently interpreted in cultural terms (e.g. 'limited wants'), but is more often a reflection of specific institutional structures or technical constraints rather than a lack of concern for increasing output *per se*. Canal irrigation could play a key role in providing the appropriate technical environment for the release of expansionary forces, though it was, by itself, limited in its potential to increase output. It was vital that the institutional as well as the technical environment was conducive to such an influence through providing the incentive for investment and growth, as well as permitting the necessary related organisational and technical responses.

It follows, therefore, that a crucial focus of this study must be on the interaction between the precise form of the local irrigation facilities (reliability, terms on which it is available, and so forth) and the specific recipient environments (physical, economic, technical, social, and cultural). This point of interface is effectively the source of what Professor Eric Stokes referred to as 'differential impact', for it is this which determines not only the potential of the input, but the degree to which (and manner in which) it will be realised. Thus it is possible, in Chapter 8, by examining this area of interface, to show why the canal had different effects in different parts of the Doab; why growth rates and growth patterns differed. The canal's impact is not simply a reflection of the specific environment into which it was introduced. This final chapter examines how the pattern of distribution of benefits it created, in the Meerut division at least, was itself a factor in perpetuating the cycle of growth and prosperity which had been established. The comparative dynamism and vitality of the western districts, with their growth and noticeable diversification, were in striking contrast to the eastern districts of the UP particularly, and a far cry from the gloomy impression given in *Agrarian Conditions*. Ironically, it is the alleged villain of the piece, the canal, which is

[14] This is clearly demonstrated for the Punjab in C.J. Dewey, 'The Agricultural Output of an Indian Province: The Punjab, 1870–1940', paper presented at the Institute of Commonwealth Studies, London, April 1972.

finally shown primarily to explain the dynamism and prosperity.

The study begins, however, with a chapter which sets the development of the Doab canals in the broader context of the growth of irrigation in India as a whole, and which then traces the history of the significant UP works. It outlines the main physical difficulties confronting the pioneering engineers, and the experiments and controversies which marked the evolution in design and construction towards a technically effective basic system of irrigation.